Smart Factory

Capstone Design(2)

김진용 양성모 임대권

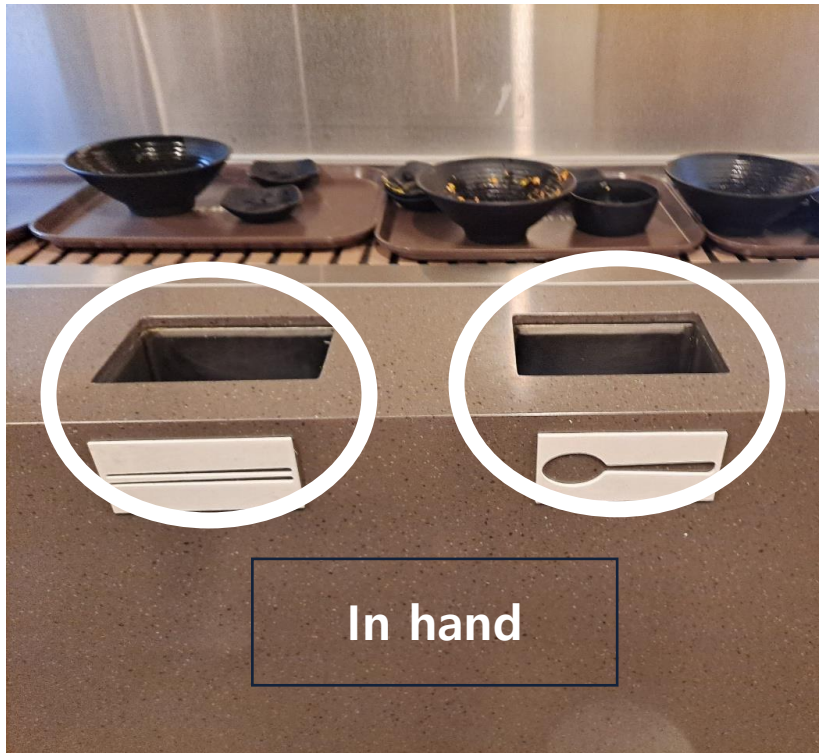
A Table of Contents.

Smart Factory

- **Sensors (IoT) are installed in facilities and machines in the factory to collect and analyze data in real time.**
- **All the situations in the factory are clearly seen, and the factory is self-controlled according to each purpose by analyzing them.**

Smart Factory system

Part 1. Problem definition

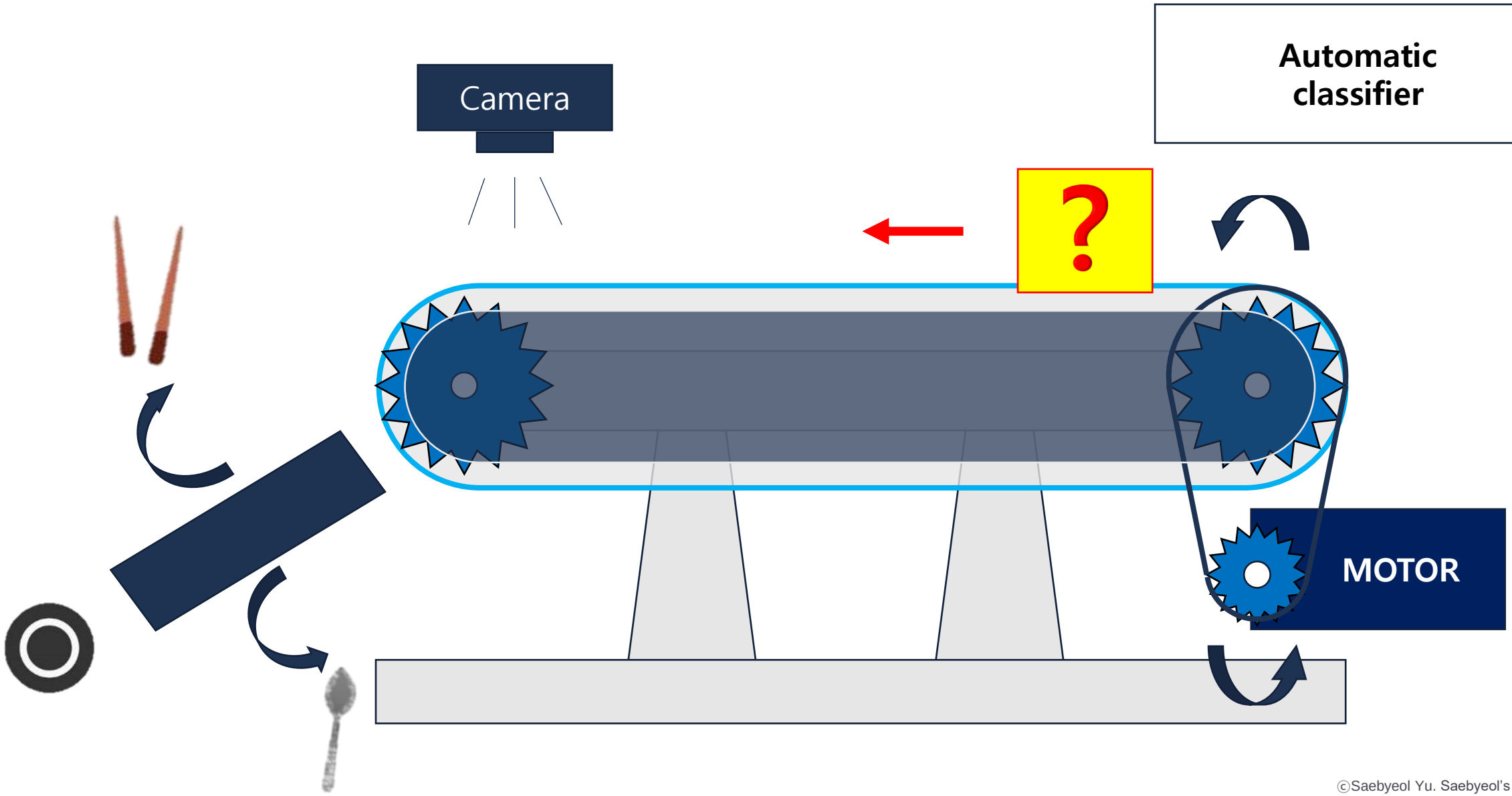


Automatic classification

Chung-ang university 310 Restaurant

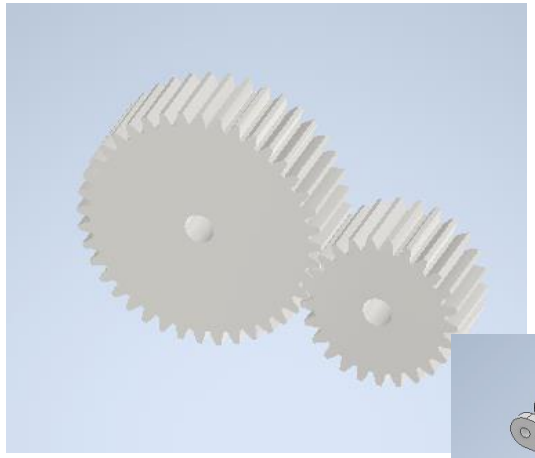
Smart Factory system

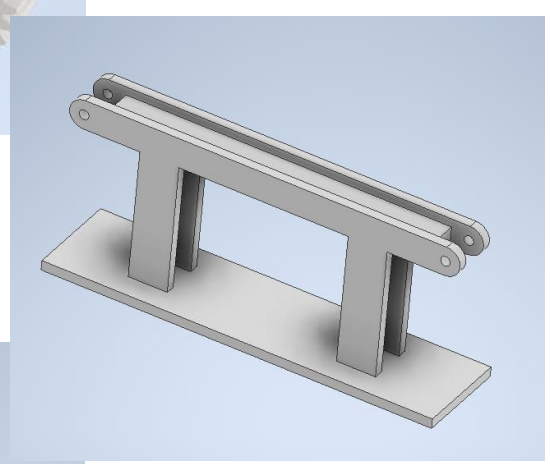
Part 1. Prototype

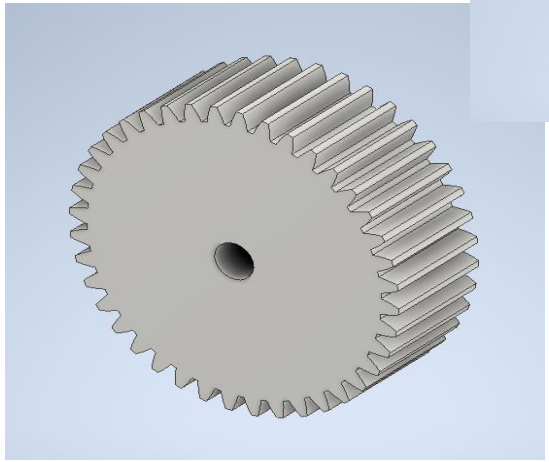


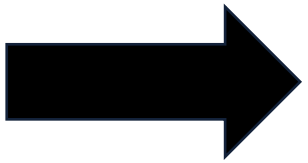
Smart Factory system

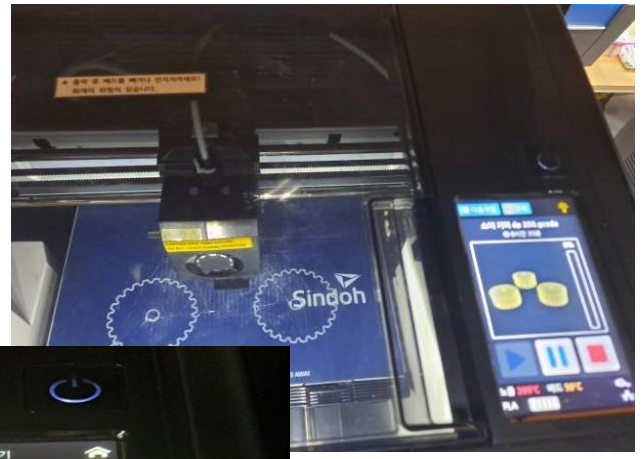
Part 1. Hardware

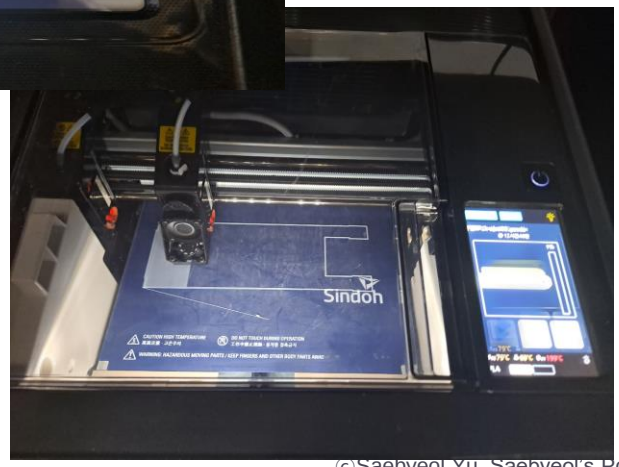






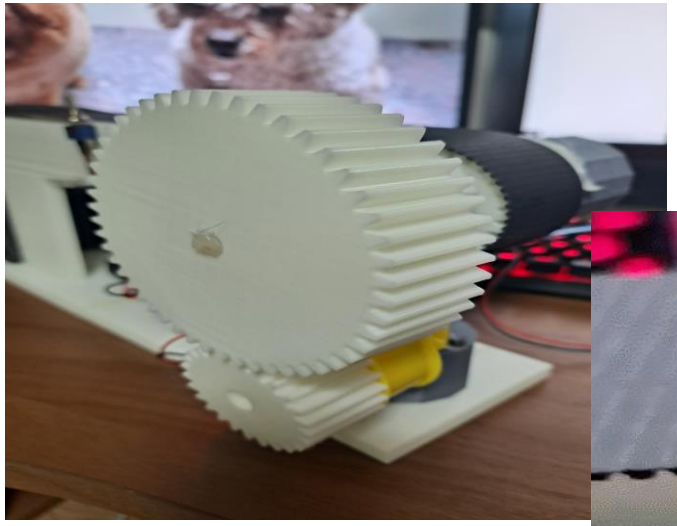


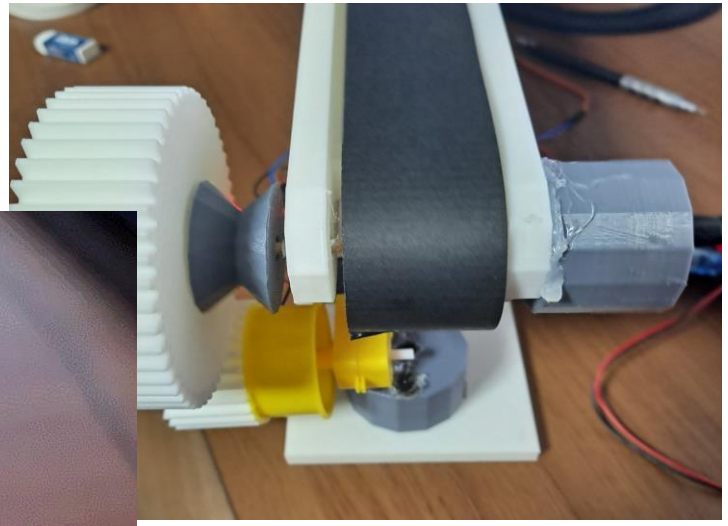


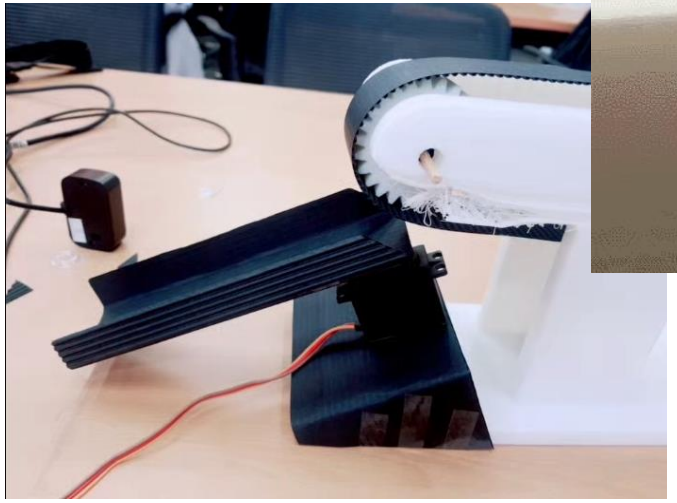


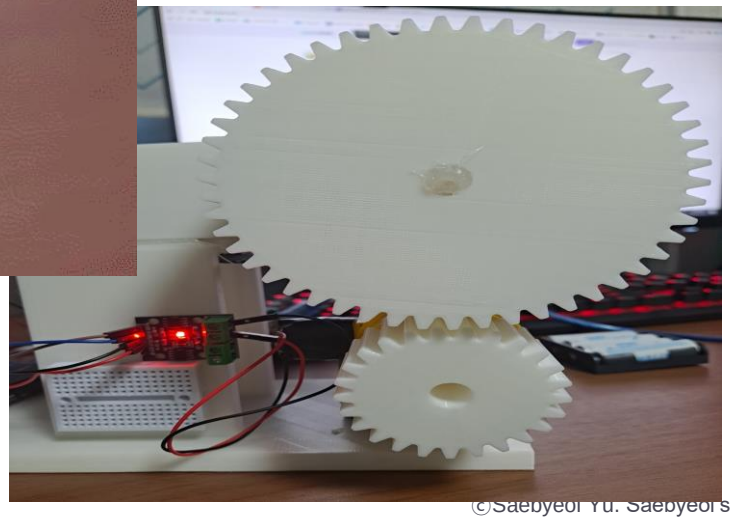
Smart Factory system

Part 1. Hardware



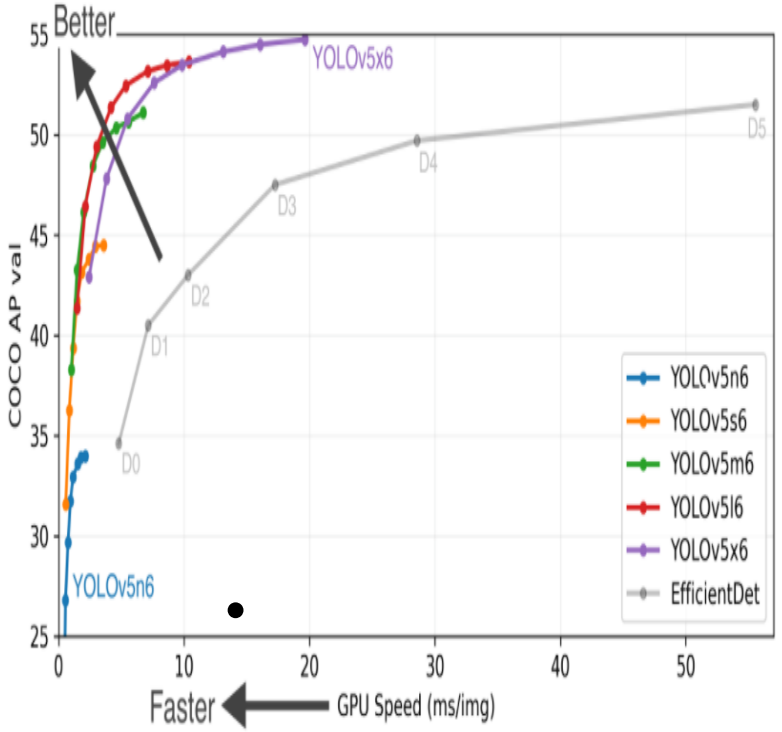






Part 2. Software

YOLO model



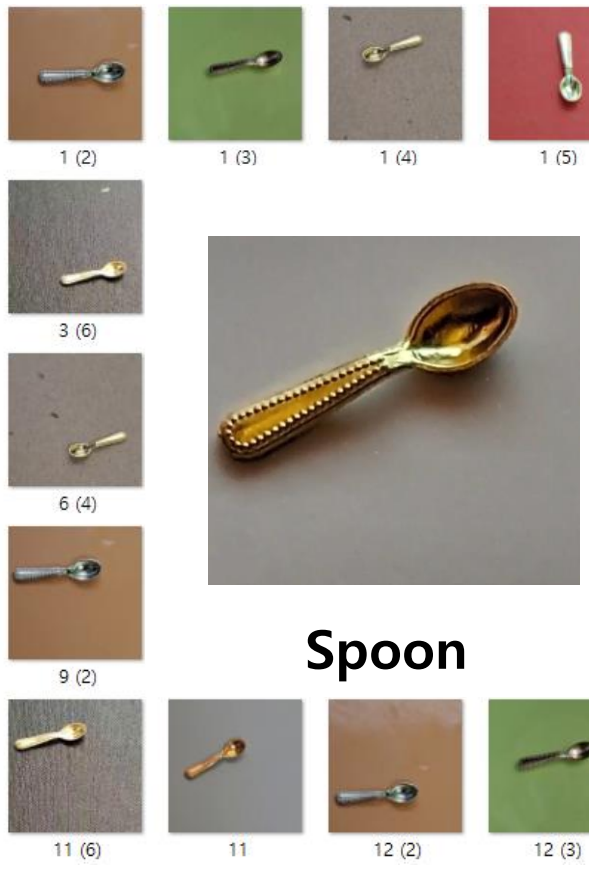
Model	size (pixels)	mAP^{val} 0.5:0.95	mAP^{val} 0.5	Speed CPU b1 (ms)	Speed V100 b1 (ms)	Speed V100 b32 (ms)	params (M)	FLOI @64 (B)
YOLOv5n	640	28.4	46.0	45	6.3	0.6	1.9	4.5
YOLOv5s	640	37.2	56.0	98	6.4	0.9	7.2	16.5
YOLOv5m	640	45.2	63.9	224	8.2	1.7	21.2	49.0
YOLOv5l	640	48.8	67.2	430	10.1	2.7	46.5	109.

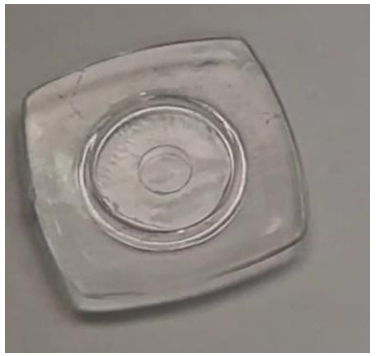
yolov5l.pt	89.2 MB
yolov5l6.pt	147 MB
yolov5m.pt	40.7 MB
yolov5m6.pt	68.7 MB
yolov5n.pt	3.77 MB
yolov5n6.pt	6.56 MB
yolov5s.pt	14 MB
yolov5s6.pt	24.5 MB
yolov5x.pt	166 MB
yolov5x6.pt	269 MB

- Real Time Object Detection Model(160 FPS, inference time: 6.3ms/frame)
- Less FLOPS(Floating point Operations per second)
- Light Weight Model(1.9M params, 3.77MB)

Smart Factory system

Part 2. Software : Collecting Dataset





Train
70%

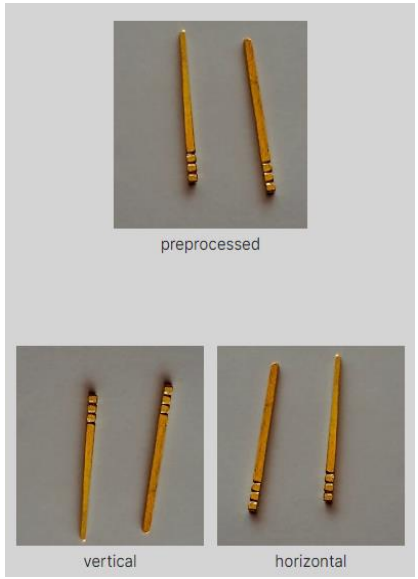
Valid
20%

Test
10%

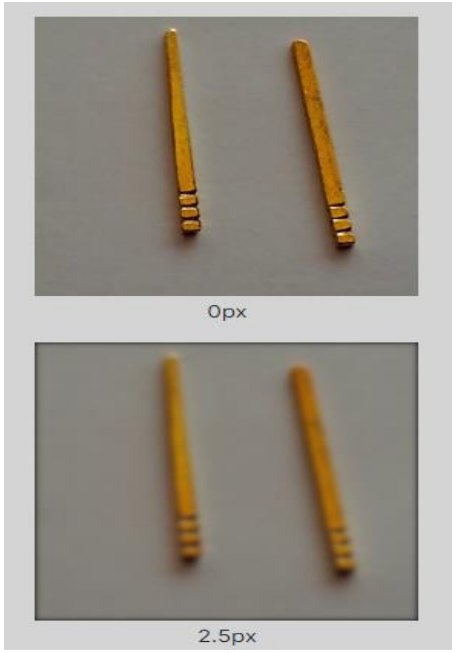
Train : 401 / Valid : 115 / Test : 57

Part 2. Software : Heavy Augmentation

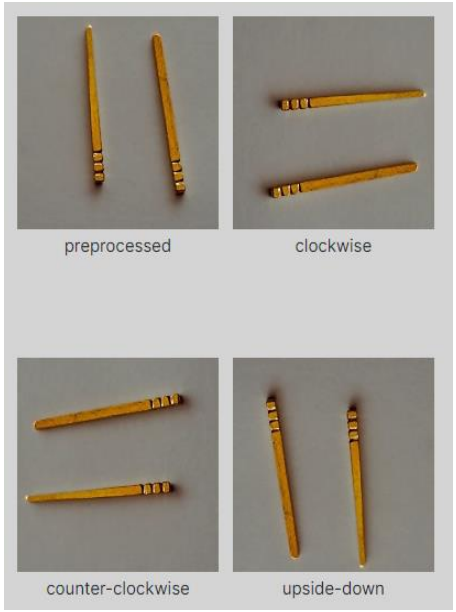
Flip



Blur

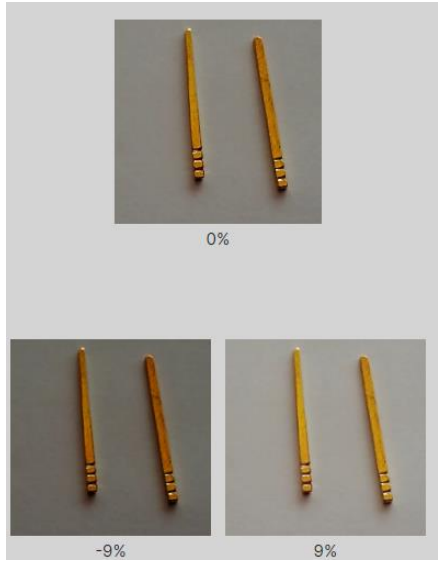


90° Rotate



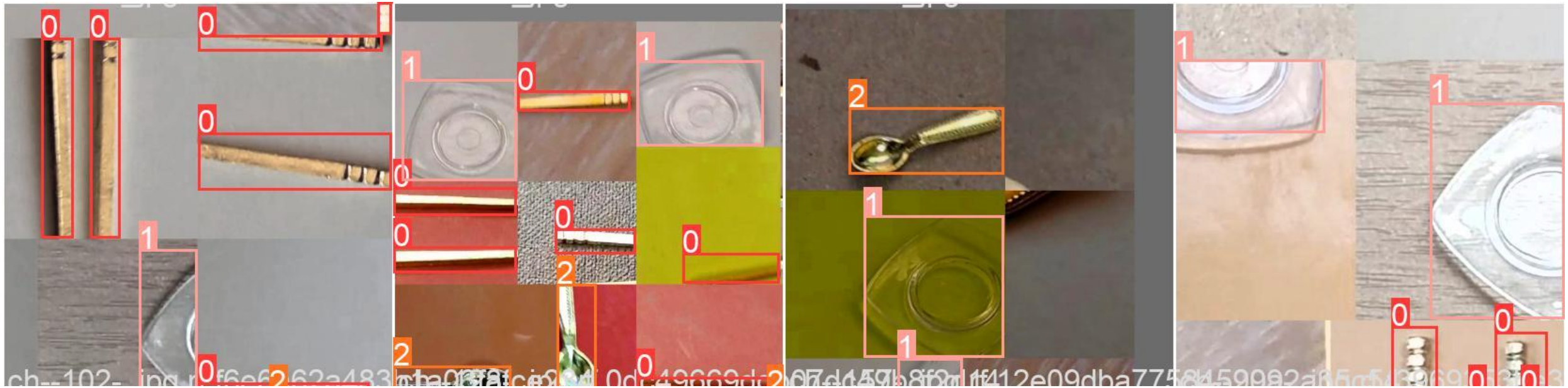
Mosaic

Exposure



Smart Factory system

Part 2. Software : Heavy Augmentation



Flip: Horizontal, Vertical

90° Rotate: Clockwise, Counter-Clockwise, Upside Down

Exposure: Between -9% and +9%

Blur: Up to 2.5px

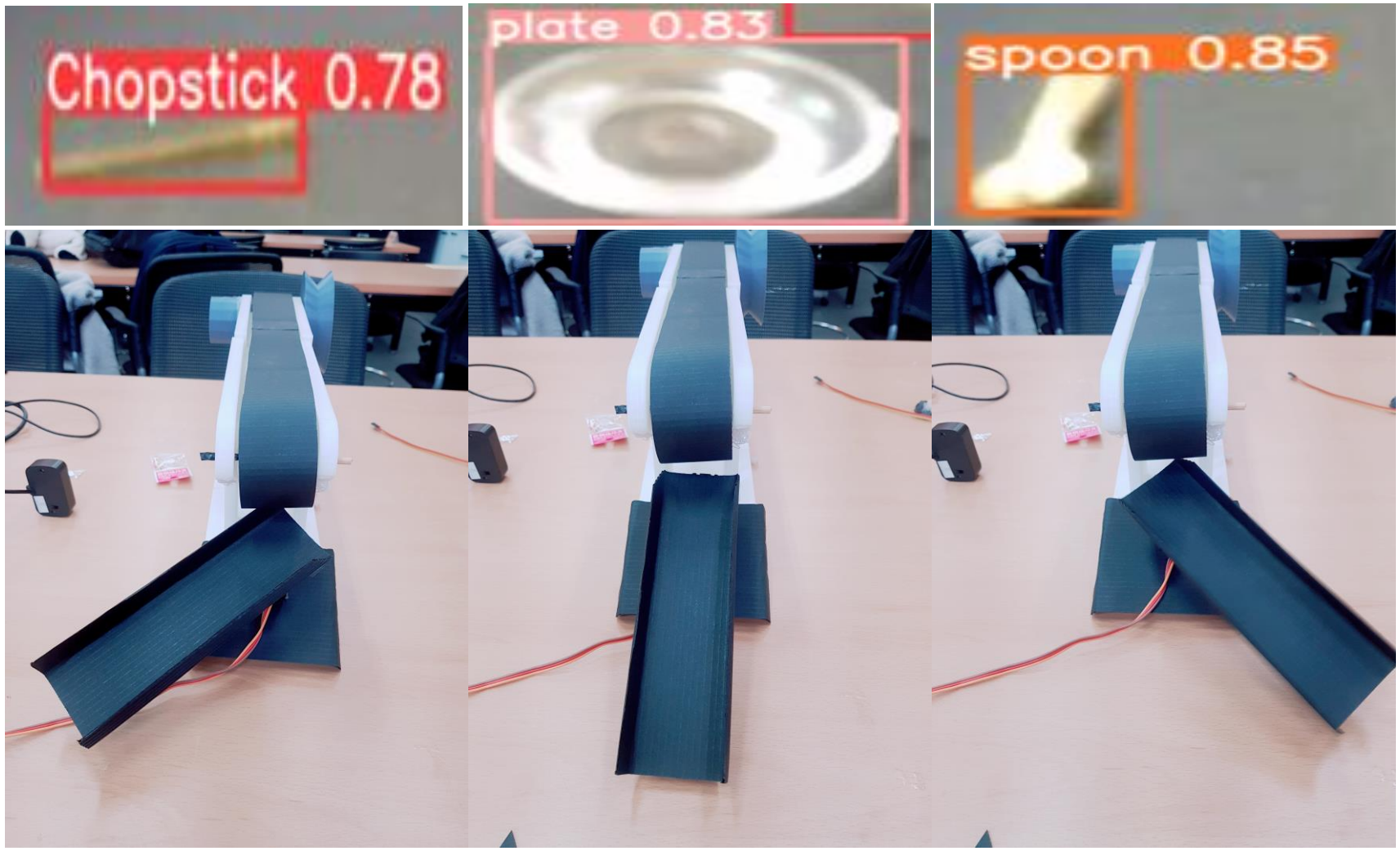
Mosaic: Applied

Train : 1203 / Valid : 115 / Test : 57

0 : Chopsticks / 1 : Dishes / 2 : Spoon

Smart Factory system

Part 3. Automatic Classifier



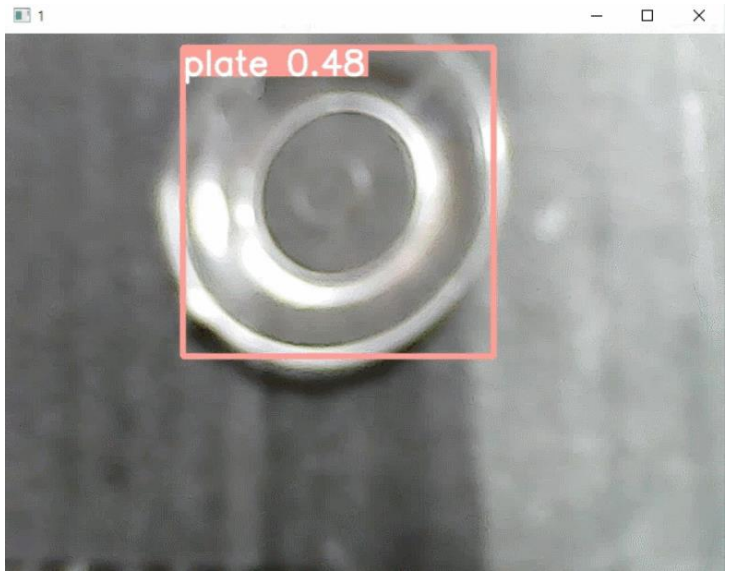
Smart Factory system

Part 3. Automatic Classifier

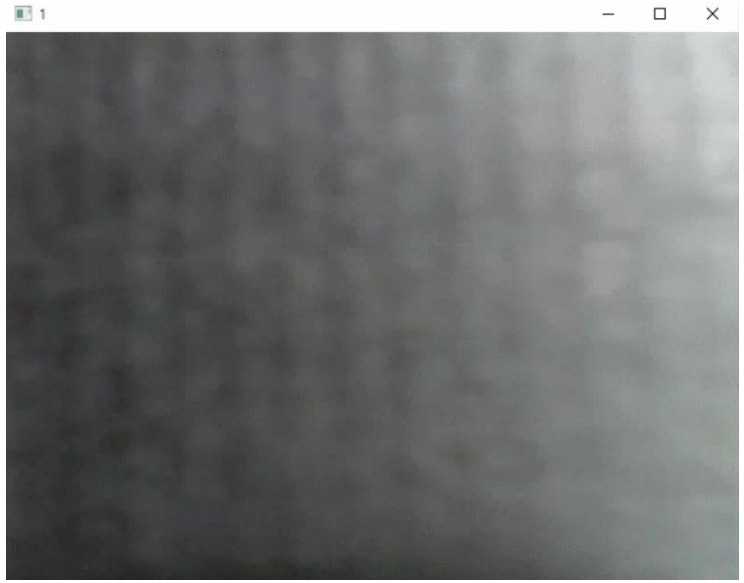
Demonstration video

Part 4. Review

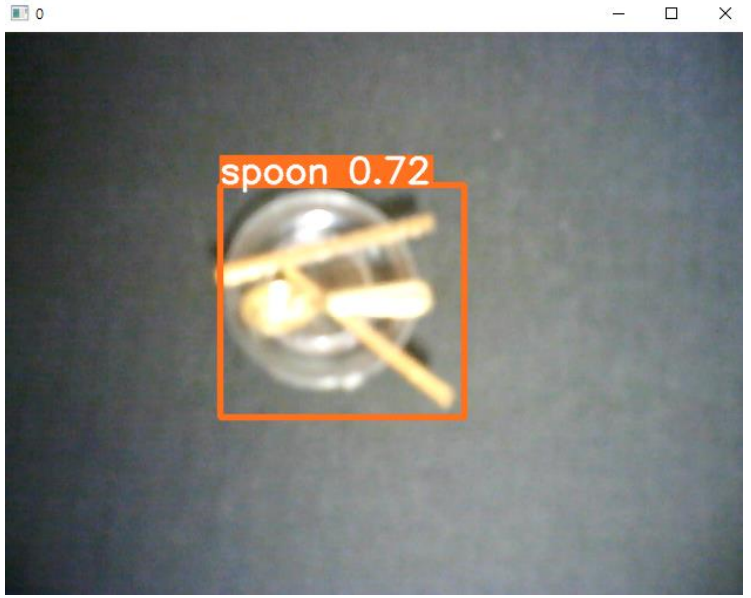
Product Limit



Two object in one frame



Misprediction



Overlapping

Part 4. Review

Expectation Effectiveness

- Automation classification tasks are possible without high-performance computer resources in the actual logistics system.
- Automation classification of objects without barcode is possible.

Points to be reinforced

- Post-processing when there are several objects inside the frame (when overlapping).

Thank you!